LOWER CARBONIC GASTEROPODA FROM BURLINGTON, IOWA.

BY CHARLES R. KEYES.

Inquiry has disclosed the remnants of an exceedingly rich and varied fauna that, in the vicinity of the present city of Burlington, Iowa, once tenanted the littoral zones of a vast Carbonic sea. The peculiar lithological characters of the depositions are not, however, conducive to the good preservation of the entombed animal remains; and, for the most part, the vestiges of the gasteropods are, in consequence, almost entirely obliterated. Nevertheless, there have been obtained a considerable number of shells the structural characters of which are unimpaired and exhibit in a very satisfactory manner all the generic and specific details. These reveal a very suggestive chapter in the faunal history of the early Carbonic over the broad interior basin.

More than a quarter of a century has passed since the mollusca of the Kinderhook and Burlington beds have elicited attention. The early investigations of Hall, White and Winchell brought to light numerous interesting forms, the greater portion of which were collected in the immediate neighborhood of the locality mentioned. But since the appearance of the original descriptions of the fossils contained in these rocks, there has accumulated considerable additional material, which elucidates some hitherto obscure questions relative to the zoological position of the various species and their distribution in time and space.

D. D. Owen [1] was the first to call attention, geologically, to the rocks exposed at the city of Burlington. In his general stratigraphic section of the region he distinguished the upper calcareous or "Encrinital" layers from the lower shaly portions which he called the argillo-calcareous group. His line of demarkation coincided approximately with that of the present Kinderhook and Burlington divisions—about fifteen feet above the fossiliferous sandstone. Owen correctly referred these rocks to the age of the lower Carbonic. Shortly after the appearance of the report on the geology of Wisconsin, Iowa and Minnesota, Hall, [2] in his reconnaissance of eastern Iowa, referred the arenaceous member (Kinderhook) to the Chemung and regarded as synchronous the yellow sandstones at the mouth of Pine creek,

[1] Geol. Sur. Wis. Iowa and Minn., 1852, p. 91.

[2] Geol. Iowa, Vol. I, p. 88, 1858.

Muscatine county, fifty miles to the northward. But later investigations prove conclusively, as recently remarked by Calvin, [1] that the strata last mentioned are Hamilton sandstones and therefore not continuous with the beds of similar composition farther southward. White, [2] following Hall, also considered the lower portion of the Burlington section as Chemung, but afterwards [3] concurred with Meek and Worthen [4] that it was not Devonic, but belonged properly to the age following. Thus after nearly twenty years, the original opinion of Owen relating to the correlation in time of the arenaceous beds below the "Encrinital" limestone in southeastern Iowa is finally sustained.

The Lower Carbonic rocks at Burlington have already been treated in detail by Hall and White whose remarks in the present connection will require but little supplementary explanation. Also, recently, [5] the leading topographical and cenological features of the district under consideration have been briefly presented in a preliminary statement.

A generalized section of the depositions in the immediate vicinage of the city exhibits:

Loess	20 feet.
Drift (lower till)	35 "
Upper Burlington limestone and cherts	40 "
Lower Burlington limestone and siliceous shales	45 "
Kinderhook: calcareous layers	6 "
Sandstone	5 "
Limerock	14 "
Blue clayey and sandy shales—exposed	85 "
	250 feet.

It is to be noticed that the stratigraphic rocks of Burlington present a maximum exposed thickness of nearly two hundred feet, a little more than one half of which may be regarded as Kinderhook. Lithologically the strata of the lower member are made up chiefly of bluish sandy shales which in some places pass into fine-grained sandstones. Towards the superior limit of this division are several

[1] Am. Geol., vol. III, p. 25.

[2] Jour. Boston Soc. Nat. Hist., vol. VIII, p. 209 *et seq.*

[3] Geol. Iowa, Vol. I, p. 191. 1870.

[4] Am. Jour. Sci., vol. XXXII, p. 177. 1861.

[5] Keyes: Am. Naturalist, vol. XXII, p. 1049 *et seq.*

feet of gray, compact and oolitic limestones. The upper part of the great arenaceous bed is charged with casts of brachiopod and lamellibranch shells; it also contains a number of gasteropods and a few pteropods. A similar sandstone ten feet above presents like faunal peculiarities. The fossils of the calcareous layers are usually in an excellent state of preservation, especially those occurring in the oolites; and it is from the latter that the most satisfactory material for serial comparisons is obtained.

The Burlington limestone is pre-eminently crinoidal in its composition. It includes also several extensive beds of siliceous shales and cherts. The greater portion of this division is composed of thick- and thin-bedded limerock, the layers of which are frequently separated by clayey or sandy partings. Alternating with the firmer strata are often great beds of coarse friable rock made up almost wholly of the disjointed and comminuted skeletal remains of echinoderms. In all observable characters—stratigraphic, faunal and lithologic—the two members of the Lower Carbonic at Burlington present a very marked contrast. The most distinctive feature, perhaps, is the great preponderance of crinoidal remains in the upper part; while in the lower, or Kinderhook, there are but few traces of the feather stars.

Attempts have been made at various times to subdivide the Burlington limestone into upper and lower sections; the chief basis for separation being the difference in the crinoid faunæ contained. While in the *ensemble* there is a very noticeable dissimilarity in the general expression of the species of the two divisions there is not, as is claimed, a totally distinct group of forms in each. Recent observations indicate that a considerable proportion of the species in the Lower Burlington are also present in the Upper; and even pass with some slight structural modifications into the Keokuk. With the material already accumulated, the transitionary relations of the various species have been traced; and there appears to be but little doubt that the respective faunæ of the two members were the biologic successors of one another, at least in the region of south-eastern Iowa. It has further been shown recently [1] that the limestone of the continental interior, usually denominated the Burlington and Keokuk, practically belong to a single epoch.

Briefly summarized, the general faunal features as set forth in the following pages indicate very different bathymetric conditions during

[1] Keyes: Am. Jour. Sci., (3), vol. XXXVIII, p. 186.

the deposition of the Kinderhook and Burlington beds. When the strata of the first were being laid down it would seem that in the vicinity of the present city of Burlington there was very shallow water, which probably did not have, at all times, free connection with the open sea. But in the succeeding epoch it is evident that the depth of the oceanic expanse considerably increased at that place.

In the Kinderhook there is a notable absence of certain classes of animal remains, principally crustaceans, echinoderms, corals, and bryozoans; while in the Burlington these groups, excepting perhaps the articulates, are well represented. On the other hand the mollusca were particularly abundant in the lower, but of rare occurrence in the upper, division. Bryozoa are rare; brachiopoda abundant. The cephalopoda are represented by several genera, but individually they are not common; none have been as yet observed in the superimposing layers. Of the pteropoda several species of *Conularia* have been obtained. The lamellibranchiata are quite plentiful and with the exception of two genera are not found in the limestones above. The gasteropods include upwards of fifteen genera and fifty species. But only two of the generic groups—*Platyceras* and *Straparollus*—have thus far been recognized in the Burlington strata, in which there occur eight species of the first genus and two of the second. In the Upper Burlington *Platyceras* is especially common and is often found attached to the ventral surfaces of crinoids. It is worthy of note that several of those shells observed adhering to the stalked echinoderms are specifically identical with certain Keokuk *Platycerata* and that in both horizons the various forms of gasteropods are associated with crinoids of similar anatomical construction. Some of the species of *Platyceras* which are first known in the upper Burlington became in the Keokuk very abundant, and widely distributed geographically. It may also be remarked that the Keokuk forms seem to follow the Burlington species in direct biologic sequence; but that between the Kinderhook and Burlington no such close affinities are traceable in this genus.

The Straparolli of the Burlington rocks are all angulated forms. In *S. latus* Hall there are two well defined angularities—one on the upper side of the whorls; the other on the under side. The latter is usually more or less rounded; but the former is generally surmounted by a narrow carina which gives it additional prominence. The upper surface of the volutions is flattened and the

spire depressed so as to be on a level with the outer turn, thus differing from *S. roberti* White, in which the spire is depressed considerably below the upper surface of the last whorl, making the superior carina very conspicuous. *S. roberti* appears to be the genetic successor of *S. latus*, but there is nothing to indicate that either species was immediately derived from any of the Kinderhook forms, which are all characterized by regularly rounded volutions.

In the absence, from the Burlington beds, of the other generic groups of gasteropods represented in the Kinderhook no further comparisons of the forms from the two horizons can be made. However, as previously intimated, the general aspect of the molluscan remains under consideration, from the lower division, points to the existence over the region of a shallow secluded expanse of water perhaps removed for the greater portion of the time from the immediate influence of the great mediterranean sea that at this period stretched away to the southward.

I. Species from the Burlington Beds.

Platyceras cyrtolites McChesney.

Platyceras cyrtolites McChesney, 1860. Desc. New Palæ. Foss., p. 71.

This form was originally described from the Burlington limestone of Calhoun county, Illinois. It has recently been obtained from the upper layers of the same horizon at Burlington, Iowa. At the latter place it is quite rare; and the shell is usually exfoliated. It appears to have its nearest affinities in certain forms of the superimposing Keokuk beds.

Platyceras equilaterum Hall.

Platyceras equilaterum Hall, 1859. Geol. Iowa, vol. I, Supp., p. 89.

Platyceras equilaterum Meek and Worthen, 1873. Geol. Sur. Illinois, vol. V, p. 518.

Platyceras equilaterum Keyes, 1888. Proc. Am. Philosophical Soc., vol. XXV, p. 236.

This species is one of the most characteristic gasteropods of the Keokuk limestone. In the upper Burlington rocks it has lately been found attached to the ventral surface of *Gilbertsocrinus typus* (Hall). The sedentary habits of the members of this genus have been fully discussed elsewhere and need not be considered here. Suffice it, that fifteen species of this group have been observed on the calyces of various crinoids, particularly those having a more or

less depressed or flattened dome. Like all the individuals resting on flat crinoidal vaults, the shells of this species, when thus situated, are very much more depressed than in the normal specimens. The following summary of the habits of certain Platycerata may be here restated: (1) many species of *Platyceras* were stationary during life; (2) the nourishment of these gasteropods was derived in part, at least, from the excrementitious matter of the echinoderms to which they were attached; (3) the surface of attachment governs in great measure the form of the shell and the shape of its aperture. From the evidence at hand it is probable that the genus in America did not survive beyond the close of the Paleozoic.

Platyceras fissurella Hall.

Platyceras fissurella Hall, 1859. Geol. Iowa, vol. I, Supp., p. 90.

Platyceras fissurella Meek and Worthen, 1873. Geol. Sur. Illinois, vol. V, p. 529.

The species under consideration was first obtained from the Keokuk rocks at Nauvoo, Illinois; but it appears also to be represented in the upper Burlington. As shown conclusively by Meek and Worthen the apical portion is not perforated naturally, as supposed by Hall; the opening at the apex being merely an accidental fracture.

Platyceras infundibulum Meek and Worthen.

Platyceras subrectum Hall, 1859. Geol. Iowa, vol. I, Supp., p. 89 (pre-occupied).

Platyceras infundibulum Meek and Worthen, 1866. Proc. Acad. Nat. Sci., Phil., p. 266.

Platyceras infundibulum Keyes, 1888. Proc. Am. Philosophical Soc., vol. XXV, p. 238.

The form for which Hall proposed the name *P. subrectum*, in the supplement to the Iowa report, was altered by Meek and Worthen to *P. infundibulum*, the first term having been preoccupied. Like *P. equilaterum* this species is widely distributed over the interior basin, chiefly through the Keokuk rocks. In the upper Burlington limestone it has been found adhering to the anal side of *Eucladocrinus millebrachiatus* W. and Sp. The blue Keokuk shales of Crawfordsville, Indiana, have afforded for study an extensive series of this species; and the effect of its station in changing the shape of the shell and in giving rise to the great diversity of forms observed, has been very satisfactorily made out.

Platyceras latum Keyes.

Platyceras latum Keyes, 1888. Proc. Am. Philos. Soc., vol. XXV, p. 242.

A broad depressed form from the upper Burlington limestone. In this shell there are no folds or imbricating lines of growth observable; and it is very probable that the habits of this species differed somewhat from its nearest relative *P. equilaterum*. It is of rare occurrence, though associated forms are quite common.

Platyceras obliquum Keyes.

Platyceras obliquum Keyes, 1888. Proc. Am. Philosophical Soc., vol. XXV, p. 241.

A rather large robust species, which, like the majority of the molluscan shells from the white limestones of the upper Burlington division, is usually exfoliated; and crumbling quickly away, it leaves only the internal casts.

Platyceras quincyense McChesney.

Platyceras quincyense McChesney, 1861. Desc. New Foss., p. 90.

Platyceras quincyense Meek and Worthen, 1868. Geol. Sur. Illinois, vol. III, p. 510.

Not uncommon in the upper Burlington; and sometimes found resting on the vault of *Physetocrinus ventricosus* (Hall). One of the most important distinctive features assigned to this species is its peculiar quinquelobate appearance; but the real cause of the *five* broadly rounded lobes did not suggest itself until the discovery of an individual adhering to the dome of a crinoid in which the interradial areas were considerably depressed, leaving the ambulacra rather highly elevated. The growing margin of the gasteropod shell, in following the inequalities of the surface upon which it rested, gradually assumed the lobate form.

Platyceras tribulosum White.

Platyceras tribulosum White, 1883. 12 th. Ann. Rept. U. S. Geol. Sur. Ter., pt. i, p. 168.

First known from this locality, where it is found in the upper beds of the Burlington limestone. It is one of the few spiniferous species from the American paleozoic rocks; and differs from *P. biserale* Hall, of the same horizon, chiefly in having three, instead of two, longitudinal rows of spines. These appendages, though seldom preserved entire, are long, slender and tubular. It may be added

that the type is somewhat deformed and is not a characteristic representative of the species.

Straparollus roberti (White).

Euomphalus roberti White, 1862. Jour. Boston Soc. Nat Hist., vol. IX, p. 22.

This species is very closely allied to *S. latus* (Hall). It is, however, somewhat smaller, with the spire depressed below the upper surface of the body whorl. The superior flattened area is inclined inwardly thus making the outer carina more prominent than in Hall's species. This form was described from the upper beds, and occurs in the massive white limestone layers. It is, probably, the genetic successor of *S. latus* of the lower Burlington; and has undergone but slight modifications in structure.

There has always been a considerable diversity of opinion as to the real relations of *Euomphalus* Sowerby and *Straparollus* Montfort. The two groups have commonly been regarded as generically distinct, but equally good reasons have been advanced for considering them synonymous, and some writers even go so far as to unite both with *Solarium* Lamarck. Whatever may be the final decision in regard to the genera established by Sowerby and Montfort, there appears, at present, no reliable criteria by which a satisfactory separation can be made of the planorbicular forms with angulated whorls and those having the spire somewhat elevated and the volutions rounded. Although the extreme representatives of the two are apparently very distinct, the individuals are so variable and the gradations so complete, even among those of the same species, that the generic limits usually assigned are not tenable. *Euomphalus* is typified by such forms as *E. pentagonus* Sowerby; *Straparollus* by *S. dionysii* Montfort. Among the Burlington series the first section is, perhaps, best represented by Hall's *Euomphalus latus*, in which the depressed spire is nearly on a level with the body whorl. The upper surface of the latter, being flattened, gives rise to two rather pronounced angularities. The type of the second section has its best analogue in *S. macromphalus*. But there are numerous transitionary forms which are regularly rounded below and with only one carina above or having the angularities very much rounded and in some instances barely perceptible. The spire, which is considerably elevated in some species, in others becomes more and more depressed—even below the level of the upper surface of the last volution. A number of other generic names have been proposed which seem to be identical with

Straparollus; but these require no consideration in the present connection.

In the majority of cases the carinæ or angular prominences on the whorls of the Burlington *Straparolli* appear to be simply thickenings of the shell at those points. The internal transverse section is circular, as shown when the shell is removed from the matrix forming the cast of the inside. Some species have a thickened shell, with the whorls barely in contact, or even separated toward the aperture. In instances of this kind the internal casts have much the appearance of some of the forms for which Sowerby established the genus *Phanerotinus.* But with the latter have evidently been included a number of evolute *Straparolli.*

Straparollus latus (Hall).

Euomphalus latus Hall, 1858. Geol. Iowa, vol. I, p. 605.

Shell rather large, discoid, composed of four to five rather rapidly enlarging volutions, plane above; spire nearly on a level with the upper surface of the outer whorl; suture impressed; deeply and broadly umbilicate; aperture nearly circular, flattened above. The broad flattened area occupying the upper surface of the volutions is bordered on each side by a distinct carina, the inner being near the sutural line. Below the outer ridge are sometimes two scarcely perceptible angularities—one around the periphery and the other along the middle of the whorls below. The latter, as shown in young specimens, is often well defined, but after the shell has become half-grown the obtuse prominence becomes obscured. In some specimens the ridge above the periphery is so pronounced as to leave a narrow concave area immediately beneath. *Straparollus latus* is the most characteristic form of the genus occurring in the Burlington, but it is not very common. It attains a maximum diameter of eight centimeters.

Metoptoma ? umbella Meek and Worthen.

Metoptoma (*Platyceras ?*) *umbella* Meek and Worthen, 1866. Proc. Acad. Nat. Sci. Phila., p. 267.

Metoptoma ? umbella Meek and Worthen, 1868. Geol. Sur. Illinois, vol. III, p. 506.

The generic relations of this and several similar forms from the Lower Carbonic rocks of the Mississippi basin are not clearly understood. The species in question do not appear to properly belong to *Metoptoma,* as originally characterized by Phillips, in the Geology of Yorkshire, and as typified by his *M. pileus* and *M.*

oblongata. Though some recent writers have greatly extended the limits of the genus and embraced a variety of other shells, it would seem that this enlargement of the generic group is of very questionable utility. It is very possible that this is the same form as that described by Hall as *Platyceras capulus*, in which case the latter term takes precedence.

II. Species from the Kinderhook Beds.

Naticopsis depressa Winchell.

Naticopsis depressa Winchell, 1863. Proc. Acad. Nat. Sci. Phila., p. 22.

No authentic examples from the lower beds of the Burlington section have come under notice, though the collections include several casts which may belong here. If this inference is correct the species certainly presents characters which differ very essentially from the typical forms of the genus.

As originally established by McCoy, in 1844, *Naticopsis* embraced certain paleozoic shells, the best American exemplification of which, perhaps, is the form described by Norwood and Pratten as *Natica ventricosa* from the Coal Measures. The most characteristic shells of the genus are therefore comparatively thin, with the spire very small and short; the outer labrum thin, as is also the callosity of the inner lip; the last whorl usually more or less noticeably flattened or slightly concave on the upper half, and ornamented towards the suture by numerous, small, short, equidistant costæ parallel to the lines of growth; surface otherwise smooth. A number of species have been erroneously referred to the genus, while some others described under different generic titles must evidently be transferred to this group. There are, perhaps, a dozen valid species of *Naticopsis* now known from the American paleozoic rocks.

Platystoma bivolve (White and Whitfield).

Platyceras bivolve White and Whitfield, 1862. Proc. Boston Soc. Nat. Hist., vol. VIII, p. 302.

The recognition of this genus in the lowest division of the Carbonic is of considerable interest, as this is the second American species recorded above the Devonian. A recent examination of the type specimens reveals a very noticeable departure of this form from *Platyceras*, and particularly from the immature shells of *Platyceras ventricosum* Conrad, with which it has been compared. The spire in *P. bivolve* is much more elevated than in the other species, while

the inner lip is much thickened, reflexed and anchylosed to the body volution. The form under consideration is with considerable difficulty distinguishable from some individuals of *Platystoma niagarense* Hall, notwithstanding the wide separation of the respective horizons of the two species.

Platystoma as defined by Conrad included those subglobose Natica-like gasteropods, in which the labrum joined the body whorl at right angles to the axis of the shell. The group is typified by *P. ventricosum*, but it is very evident that several species have been assigned to the genus, the correct reference of which is very questionable. In an extensive series of a single species, such as may be obtained of *P. niagarense* at Waldron, Indiana, the shells show an interesting gradation from those precisely like the types to individuals in which the lip is entirely separated from the body whorl, and in some instances the last volution has uncoiled for a considerable distance. These partially evolute forms often approach closely certain *Platycerata*, and it is very likely that a more careful study of the latter will disclose a nearer relationship between the members of the two groups than has heretofore been generally suspected. This tendency of the volutions to uncoil is also very apparent in several Upper Carbonic species of *Naticopsis*, as well as in various individuals of allied genera.

Platyceras cornuforme Winchell.

Platyceras cornuforme Winchell, 1863. Proc. Acad. Nat. Sci. Phila., p. 18.

This is one of the smallest forms of the genus occurring in the lower Carbonic rocks. It has a wide geographic range in the Kinderhook beds, being found not only at Burlington, but also at Lodi and other localities in Ohio.

P. vomerium Winchell, described from the same horizon has been found only in the form of internal casts in sandstone; and its specific relations cannot at present be satisfactorily made out.

Platyceras paralium White and Whitfield.

Platyceras paralium White and Whitfield, 1862. Proc. Boston Soc. Nat. Hist., vol. VIII, p. 302.

Examples have been seen from the Kinderhook beds at Le Grand, Marshall county, and Burlington, Iowa; also from Lodi, Ohio. A careful examination of the type specimens shows that the shell is composed of more than two volutions instead of one, as stated in the original description. The spire, however, is remarkably slender,

closely incurved but not contiguous. When partially embedded in the matrix the apical portions are usually not visible, thus giving it the appearance of the obliquely conical forms, whereas it actually belongs to the typical section of the genus. In the type the longitudinal plications are much more prominent than in a representative specimen of the species, while in some forms the longitudinal folds are nearly obsolete. Immature shells are laterally compressed and the surface is perfectly glabrate, with no indications whatever, of plications or imbricating lines of growth. As the individuals became larger the aperture becomes relatively more expanded and assumes a subcircular outline.

Straparollus macromphalus Winchell.

Straparollus macromphalus Winchell, 1863. Proc. Acad. Nat. Sci. Phila., p. 20.

Shell of medium size, composed of about four regularly rounded volutions; spire somewhat elevated; suture moderately impressed; umbilical cavity rather deep; aperture circular.

The spire in this species is more elevated than in any other congeneric form from the vicinity of Burlington, except, perhaps, *S. barrisi* Win., with which, if recent determinations are correct, it may prove synonymous. It has close affinities to *Straparollus* (*Euomphalus*) *cyclostomus* (Hall), from the Iowa Devonic rocks at Iowa City. Among foreign species it bears a striking resemblance to *S. costellatus* Sowerby. The form under consideration appears to be the most common species of the genus found in the locality, coming from the upper calcareous layers of the Kinderhook.

Straparollus barrisi Winchell.

Straparollus barrisi Winchell, 1863. Proc. Acad. Nat. Sci. Phila., p. 20.

This species is closely related to *S. macromphalus* Winchell. It appears to differ in having three barely perceptible angularities on the body whorl, and the spire slightly more depressed. It is from the arenaceous layers of the Kinderhook.

Straparollus (*Euomphalus*) *ammon* (White and Whitfield), described from the Kinderhook beds of the same locality, has not been noted recently. It is a small form and said to have its closest affinities with *S.* (*Euomphalus*) *spergenensis* (Hall) from the Warsaw.

Straparollus obtusus (Hall).

Euomphalus obtusus Hall, 1858. Geol. Iowa, vol. I, p. 523.

Shell large, planorbiform, composed of five to six regularly rounded volutions; spire on a level with, or slightly below, the upper surface of the last whorl; suture very deeply impressed; upper face of the volutions very slightly flattened on the inner side near the suture; umbilicus very broad and shallow; aperture circular.

This form was the first of the group recognized from the neighborhood of Burlington, and is the most characteristic gasteropod of the Kinderhook at that place. It occurs in the oolitic layer a few feet below the Burlington limestone, and is easily distinguished from all the congeneric species of the locality by its large size—often having a diametric measurement of six centimeters,—its greatly depressed spire, broad shallow umbilicus and regularly rounded whorls. In many examples of this species the volutions are barely in contact with one another, and in a few instances the outer whorl, toward the aperture, has actually become separated from the adjoining inner turns. This fact is of special interest as illustrating the first noticeable departure toward certain evolute *Straparolli* which have been referred to *Phanerotinus* of Sowerby.

From the associated beds Winchell has described a gutta-percha cast, taken from natural moulds in friable sandstone, as *Phanerotinus paradoxus*. One of the specimens figured by Hall (Palæ. N. Y., V, ii, pl. 16, fig. 16), shows the inner volutions still contiguous, while the outer whorls are not separated further than very similar casts of undoubted *S. obtusus*.

Sphaerodoma pinguis (Winchell).

Macrochilus pingue Winchell, 1863. Proc. Acad. Nat. Sci. Phila., p. 21.

The specimens which evidently represent the group formerly known as *Macrochilus* are merely imperfect casts from the arenaceous beds of the Kinderhook, and their systematic position can at best only be surmised. But unsatisfactory as the material is, it is of considerable interest to find in America the genus present so early in the Carbonic. Several American Devonic forms have been described under *Macrochilus*, but with perhaps one or two exceptions, they have been very imperfect and in most cases merely internal casts. In Europe, however, *Macrochilus* is equally well represented in the

Devonic and Carbonic, while in this country the genus is confined chiefly to the latter.

Murchisonia prolixa White and Whitfield.

Murchisonia prolixa White and Whitfield, 1862. Proc. Boston Soc. Nat. Hist., vol. VIII, p. 303.

A very characteristic, though not common, shell from the oolitic bands of the upper Kinderhook. It is usually found in a more or less fragmentary condition and the structural features are therefore seldom well shown. The whorls are eight to twelve in number, slightly convex, with a broad obtuse angularity centrally. The surface is ornamented by small well-defined revolving costæ, or thread-like lines, the one passing along the middle of the whorls being the most pronounced, while those below the median one are considerably smaller than those above.

Three other species from this locality have been referred by Winchell to *Murchisonia*, but all are more or less imperfect and their true affinities uncertain. The first of these, *M. quadricincta*, is said to be characterized by four small costæ below the revolving band. The other two are *M. neglecta* and *M. shumardiana*.

Bellerophon bilabiatus White and Whitfield.

Bellerophon bilabiatus White and Whitfield, 1862. Proc. Boston Soc. Nat. Hist., vol. VIII, p. 304.

Specimens of this species have recently been obtained in white siliceous nodules. The deeply and broadly emarginate lip, the nearly glabrate surface and a sharp narrow median carina readily distinguish this form from the associated species of the genus.

Bellerophon panneus White.

Bellerophon panneus White, 1862. Proc. Boston Soc. Nat Hist., vol. IX, p. 21.

Shell globose, composed of three or four gradually enlarging volutions, which are visible in the rather small, very deep umbilici; periphery somewhat flattened, with a very prominent longitudinal carina; the surface marked by sharp, equidistant costæ passing transversely across the whorls from the large median ridge; transverse carinæ more or less undulating and irregular, bending forward slightly as they leave the central prominence; finer lines of growth are visible between the costæ. This species bears a striking resemblance to *B. tangentialis* Phillips from the Carbonic clays of

Tournai, Belgium. The transverse ribs of the latter are, however, slightly farther apart.

Three additional species of *Bellerophon* have also been described from Burlington. These are *B. scriptiferus* White, *B. vinculatus* White and Whitfield, and *B. perelegans* White and Whitfield.

Metoptoma ? undata Winchell.

Metoptoma undata Winchell, 1865. Proc. Acad. Nat. Sci. Phila., p. 131.

A single specimen represented in the collections probably belongs to this species.

Porcellia crassinoda White and Whitfield.

Porcellia crassinoda White and Whitfield, 1862. Proc. Boston Soc. Nat. Hist., vol. VIII, p. 303.

No traces of this group have been noticed recently, except portions of a large cast, probably belonging to this species. The other three forms reported from the Burlington locality are *P. obliquinoda* White, *P. rectinoda* Winchell, and *P. nodosa* Hall.

Among the gasteropods that have been recorded from the rocks at Burlington, but which have not been observed since the appearance of the original descriptions, are two species of *Holopea*—*H. conica* and *H. subconica*, described by Winchell from the Kinderhook beds. Associated with these two forms is a third diminutive shell, apparently belonging to the Turbonidæ—*Holopella mira* Winchell. A cast in sandstone has received the name *Loxonema oligospira* Winchell. *Dentalium grandævum* Winchell, a form said to resemble *D. venustum* Meek and Worthen, is the only representative of this group recognized from the locality. No specimens of *Pleurotomaria* have been obtained lately.